

# Countermeasure Evaluations



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*Traffic Engineering Conference for Operations and Safety  
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# Safety Evaluations

- Why Evaluate?
  - Need to know if countermeasures we implement actually work
    - Typical way this is measured: “If phone stops ringing, treatment worked”
  - Need good safety data to make informed decisions
    - Spend limited taxpayer money wisely
- Safety Evaluation Group
  - Evaluated 130+ projects last year
    - <http://www.ncdot.org/doh/preconstruct/traffic/Safety/ses/projects/completed.html>
  - Evaluate low cost countermeasures, work zone issues, enforcement programs, safety systems (e.g. median barrier)
  - Develop crash reduction factors based on NC data

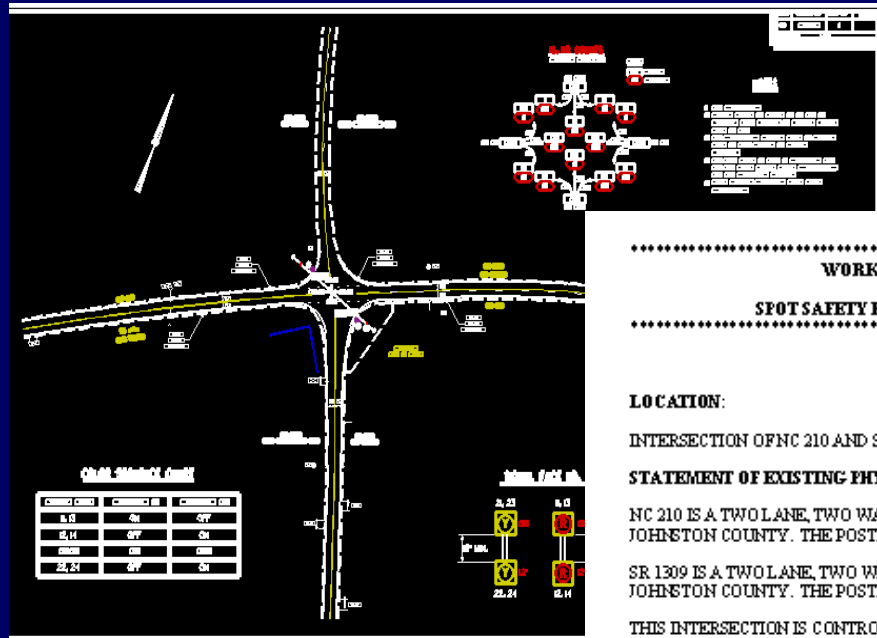
# Flasher Evaluation

- Location:
  - NC 210 at SR 1309 (Old Fairground Rd) in Johnston County || SS# 04-97-203
- Countermeasure:
  - Installation of a Flashing Traffic Signal
  - Cost: \$15,000



# Flasher Evaluation

- Research - Project File, Signal Files, Location Maps, Site Visit



\*\*\*\*\*  
**WORK ORDER REQUEST FORM**  
 SPOT SAFETY PROJECT JUSTIFICATION SHEET  
 \*\*\*\*\*

DATE: 12-31-96  
 FILE NO: 04-97-203

**LOCATION:**

INTERSECTION OF NC 210 AND SR 1309 IN JOHNSTON COUNTY

**STATEMENT OF EXISTING PHYSICAL CONDITIONS:**

NC 210 IS A TWO LANE, TWO WAY FACILITY RUNNING EAST AND WEST IN JOHNSTON COUNTY. THE POSTED SPEED LIMIT IN THIS VICINITY IS 55 MPH.

SR 1309 IS A TWO LANE, TWO WAY FACILITY RUNNING NORTH AND SOUTH IN JOHNSTON COUNTY. THE POSTED SPEED LIMIT IN THIS VICINITY IS 55 MPH.

THIS INTERSECTION IS CONTROLLED BY STOP SIGNS ON SR 1309.

**ACCIDENT EXPERIENCE:**

DURING A STUDY PERIOD FROM SEPTEMBER 1, 1990 THROUGH AUGUST 31, 1996, A TOTAL OF TWENTY-ONE (21) ACCIDENTS OCCURRED AT THIS LOCATION.

- FOURTEEN (14) WERE "ANGLE" TYPE ACCIDENTS
- THREE (3) WERE "LEFT TURN" TYPE ACCIDENTS
- THREE (3) WERE "REAR END" TYPE ACCIDENTS
- ONE (1) WAS RANDOM IN NATURE

FIVE (5) CLASS "A" INJURIES, EIGHT (8) CLASS "B" INJURIES AND SIXTEEN (16) CLASS "C" INJURIES RESULTED FROM THESE ACCIDENTS.

**TRAFFIC VOLUMES:**

NC 210 HAS AN ADT OF APPROXIMATELY 3,000 VEHICLES.

SR 1309 HAS AN ADT OF APPROXIMATELY 1,900 VEHICLES.



# Flasher Evaluation

- Existing Conditions Before Countermeasure Installation - Project File

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## **TRAFFIC VOLUMES:**

NC 210 HAS AN ADT OF APPROXIMATELY 3,000 VEHICLES.

SR 1309 HAS AN ADT OF APPROXIMATELY 1900 VEHICLES.

# Flasher Evaluation

- Determine Treatment and Intended Results

## Treatment:

Flashing Traffic Signal

## Intended Results:

Better Identify Traffic Control

### STATEMENT OF PROBLEM:

"ANGLE" AND "LEFT TURN" TYPE ACCIDENTS CONTINUE TO OCCUR AT THIS INTERSECTION AFTER SEVERAL ATTEMPTS TO CORRECT THE PROBLEM (IE. STOP BARS PAINTED, OVERSIZED STOP SIGNS INSTALLED, & STOP SIGNS AND STOP AHEAD SIGNS FLAGGED). THE TRAVELING PUBLIC SEEMS TO HAVE DIFFICULTY IDENTIFYING THE EXISTING TRAFFIC CONTROL. DUE TO THE FACT THAT ONE FACILITY IS A PRIMARY ROUTE, COMBINED WITH THE SPEED AT WHICH VEHICLES ARE TRAVELING, THIS CREATES A DANGEROUS SITUATION.

### DESCRIPTION OF IMPROVEMENT:

INSTALL AN OVERHEAD, TWO CIRCUIT FLASHER.

IT IS FELT THAT THIS IMPROVEMENT WOULD BETTER IDENTIFY THE EXISTING TRAFFIC CONTROL FOR THE MOTORING PUBLIC.

# Flasher Evaluation

- Determine Measures of Effectiveness
  - Total Crashes
  - Frontal Impact Crashes (Target Crashes)
    - Left turn same roadway, left turn different roadway, right turn same roadway, right turn different roadway, head on, and angle
  - Specifically looking for crashes where vehicles ran Stop Sign control on SR 1309 (Old Fairground Rd)

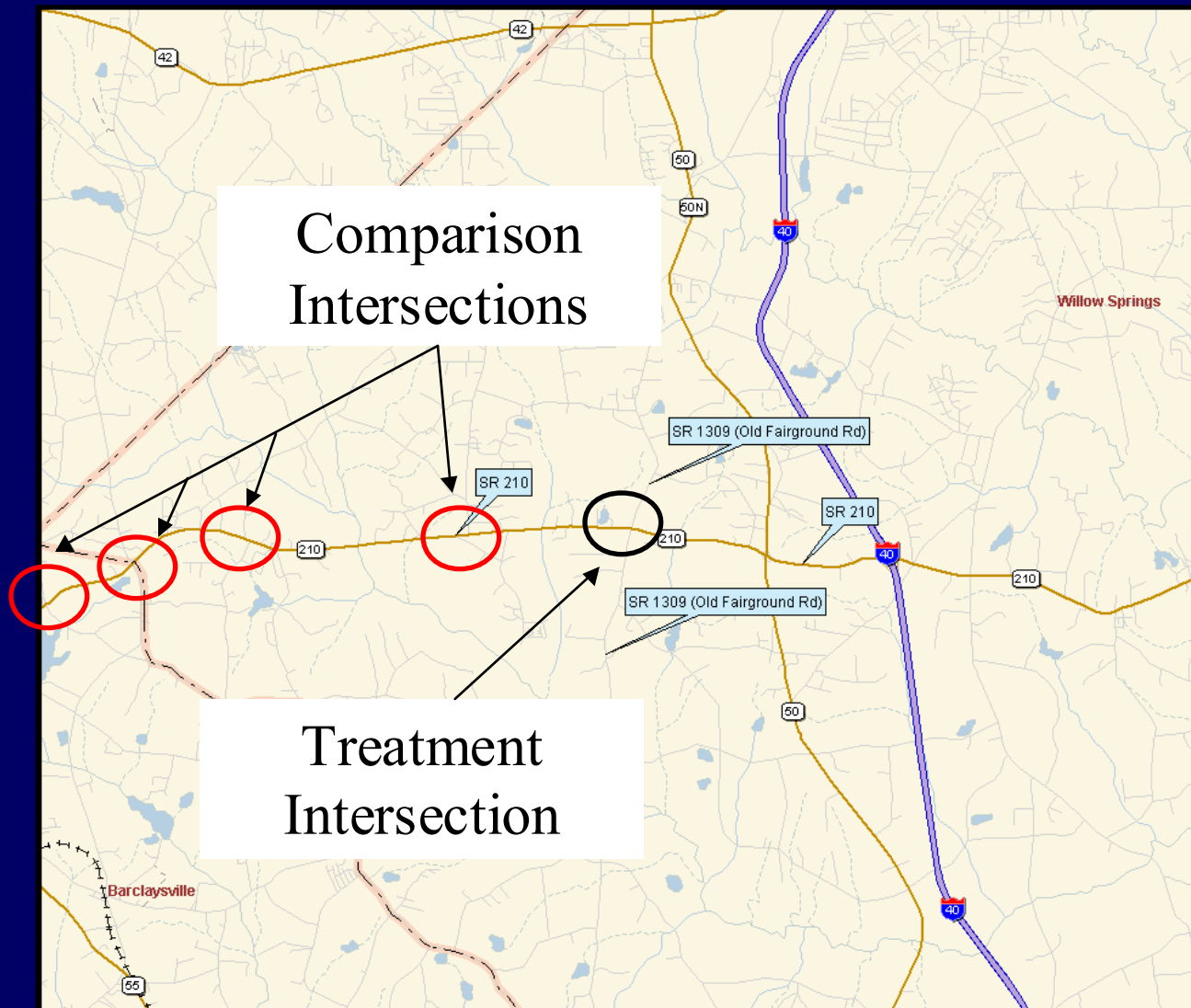
# Flasher Evaluation

- Set up Evaluation Study
  - Determine Analysis Dates
    - Project Completion Date: 4/25/1997
    - Before Period: 12/1/1990 - 2/28/1997 (6 Years, 3 Months)
    - After Period: 7/1/1997 - 9/30/2003 (6 Years, 3 Months)
  - Pick Comparison Sites
    - Criteria:
      - Similar characteristics to Treatment Location (geometry, volume, etc.)
      - Located near Treatment Location (weather, jurisdiction)
      - Not affected by Treatment being evaluated
    - Compare crash trends of Comparison Location to the Treatment Location. If trends are not similar, choose different Comparison Locations.



# Flasher Evaluation

## Comparison Locations



# Flasher Evaluation

Looking East on NC 210



Looking North on SR 1309



Looking West on NC 210

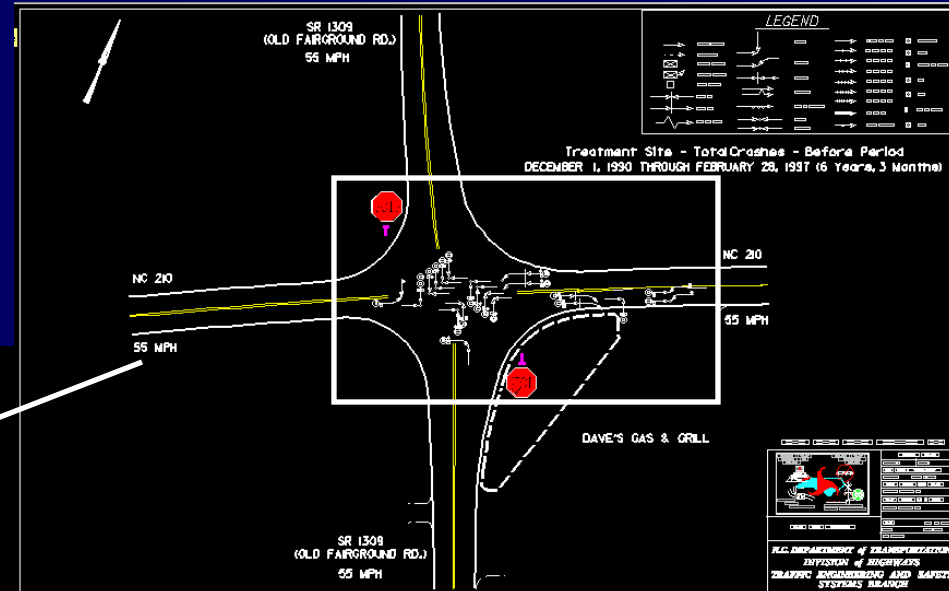
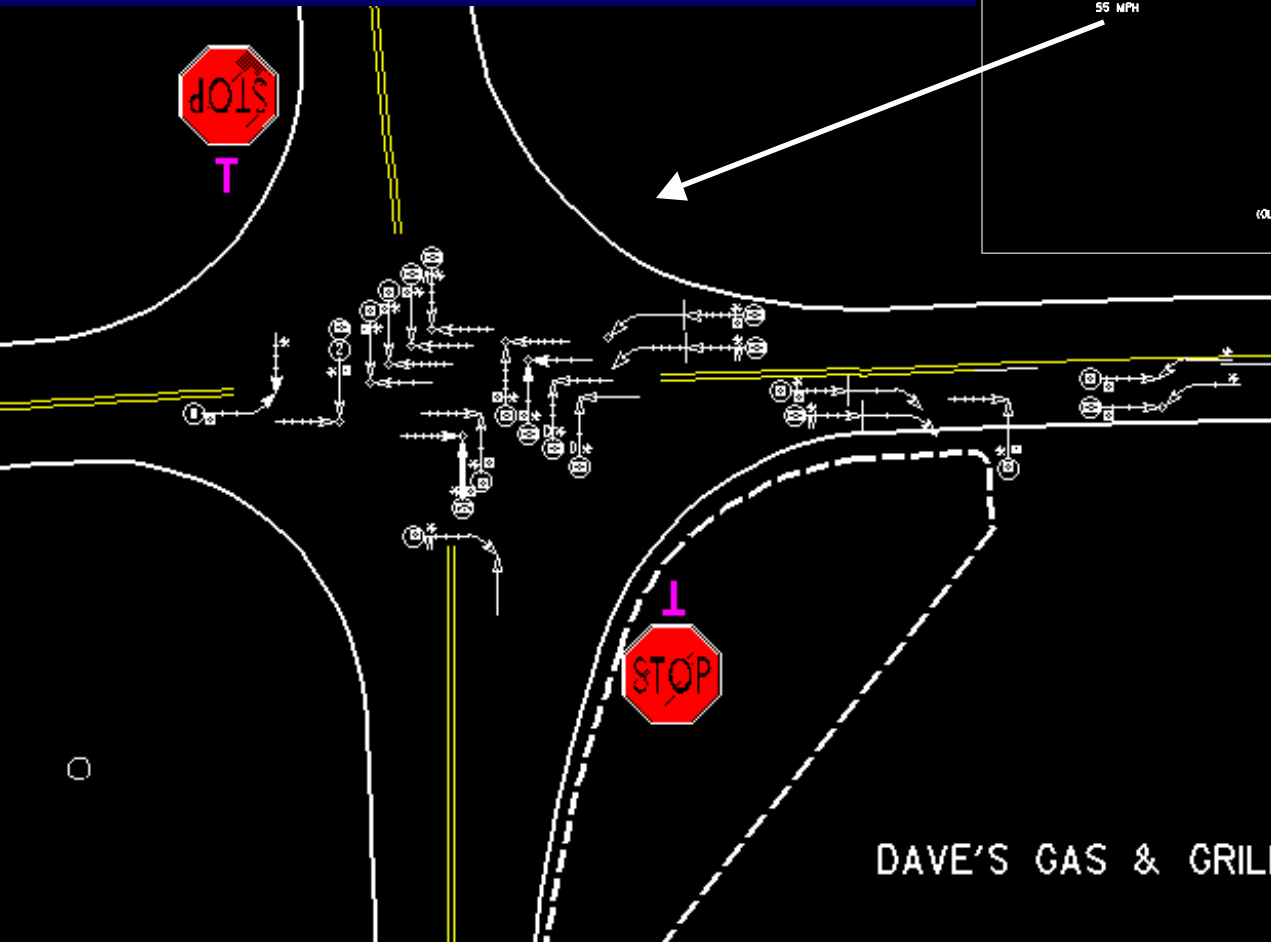


Looking South on SR 1309



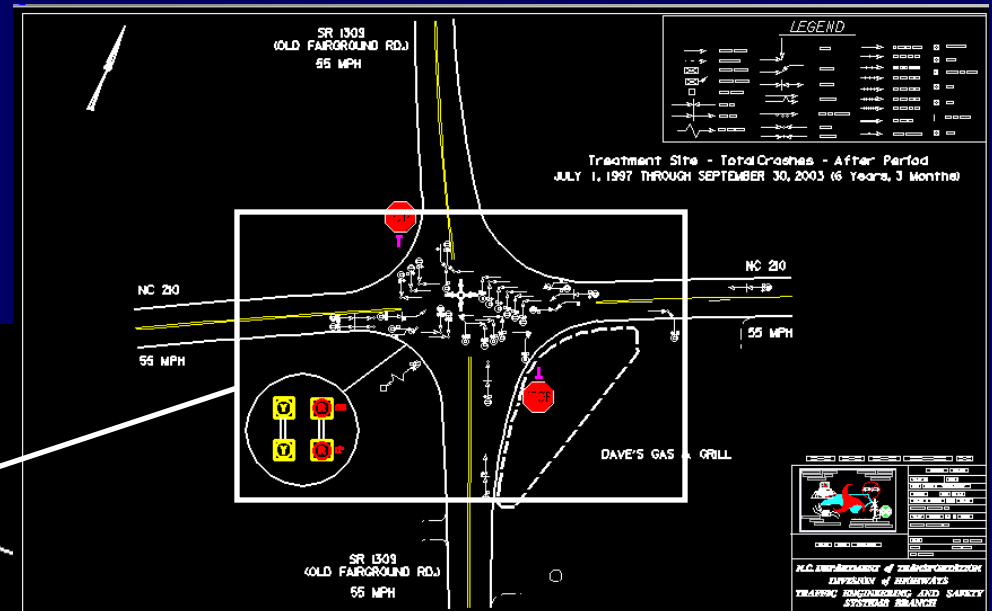
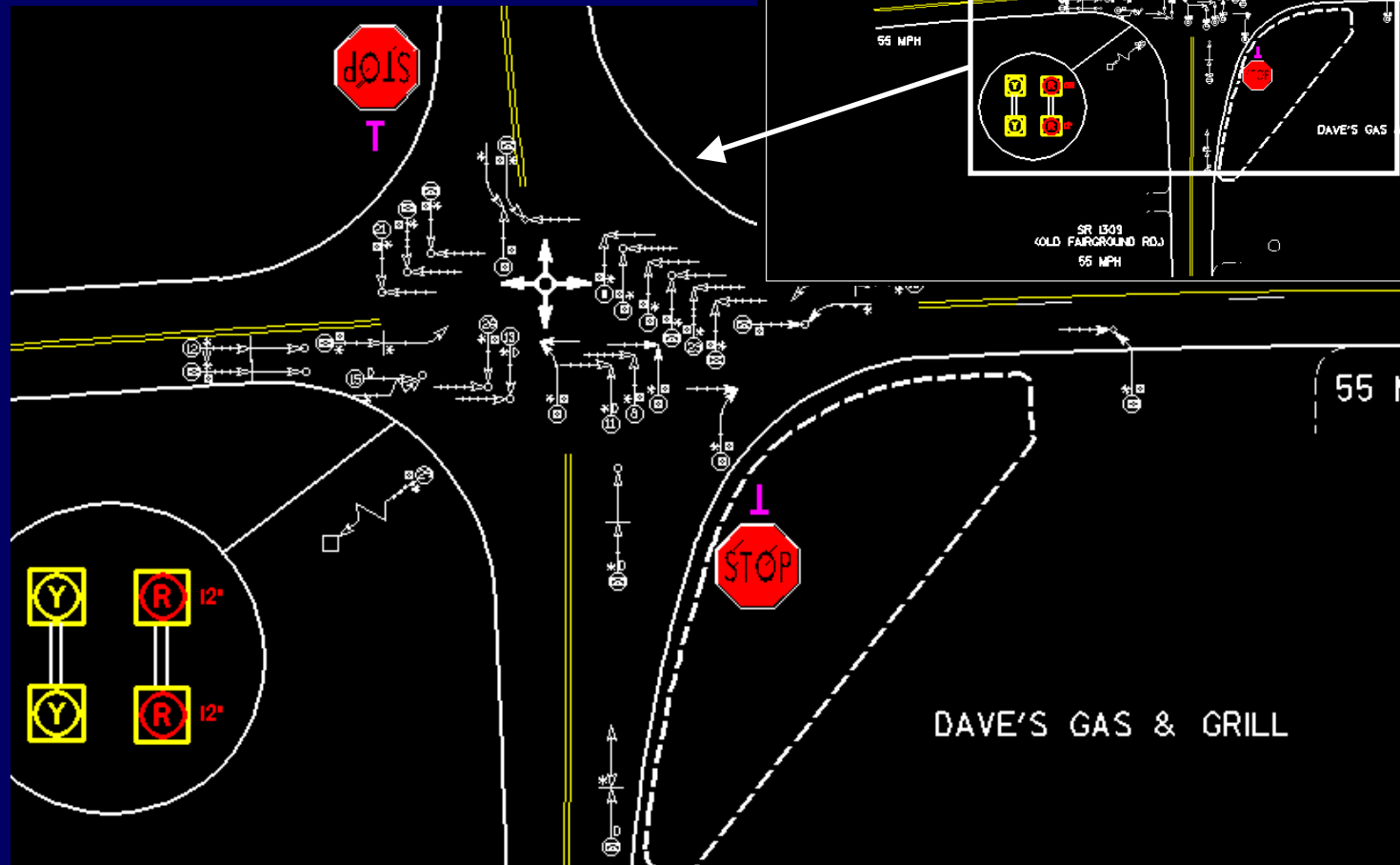
# Flasher Evaluation

Before Collision Diagram



# Flasher Evaluation

After Collision Diagram



# Flasher Evaluation

## Results

- ADT increased over 50 %
- In After Period
  - Approximately 90% of all crashes occurred during AM and PM peak periods
  - Appears increasing commuter traffic creates problem for motorists crossing NC 210
  - Vehicles not stopping at STOP sign
    - Before: 5 out of 14 crashes
    - After: 2 out of 19 crashes
    - Therefore, 17 of 19 Frontal Impact Crashes in the After Period were caused by another factor

### Treatment Information

	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	21	30	42.9
Total Severity Index	14.65	4.45	- 69.6
Frontal Impact Crashes	17	20	17.6
Frontal Severity Index	17.42	4.33	- 75.1
Volume	4300	6500	51.2

### Comparison Information

	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	61	83	36.1
Total Severity Index	11.61	6.77	- 41.7
Frontal Impact Crashes	14	15	7.1
Frontal Severity Index	9.59	16.04	67.3
Volume	2700	3800	40.7

### Odds Ratio: Treatment versus Comparison

	Before	After	Percent Reduction (-) Percent Increase (+)
Treatment Total Crashes	21	30	---
Comparison Total Crashes	61	83	5.0 %
Treatment Frontal Impact Crashes	17	20	---
Comparison Frontal Impact Crashes	14	15	9.8 %

# Flasher Evaluation

- Results / Discussion (cntd)
  - The prevalent crash problem does not appear to have been caused by a lack of recognizing the Stop Sign control condition (as was stated in the Project Justification sheet)
  - Problem seems to be more gap selection
  - Access points located close to intersection
    - Sight distance problems
    - Problems with vehicles turning into driveway

**Proper problem identification is key!**

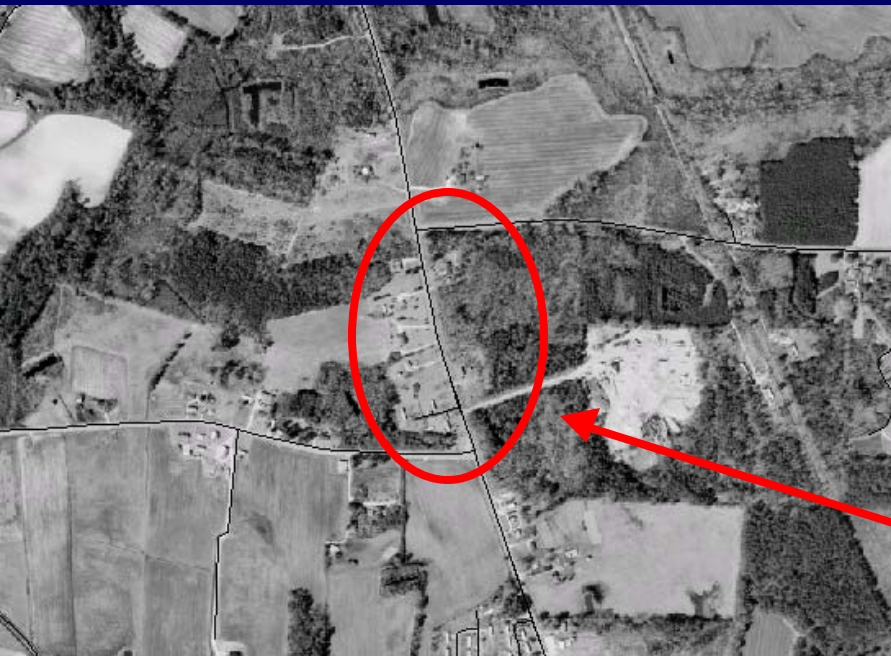
# Curve Wedging and Resurfacing Evaluation





# Curve Wedging and Resurfacing Evaluation

- Location:
  - US 401 From SR 2019 to SR 2035 in Harnett County || SS# 06-96-207
- Countermeasure:
  - Wedge and Resurface
  - Cost: \$35,000



Treatment  
Location



# Curve Wedging and Resurfacing Evaluation

US 401 - Look North



US 401 - Look North



US 401 - Look South

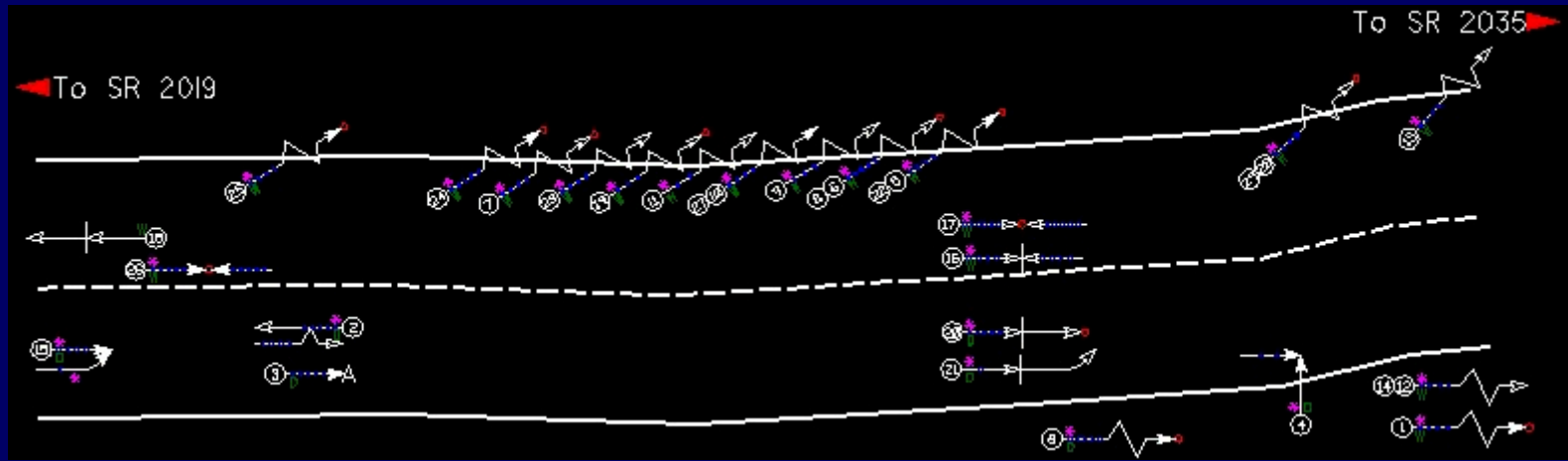
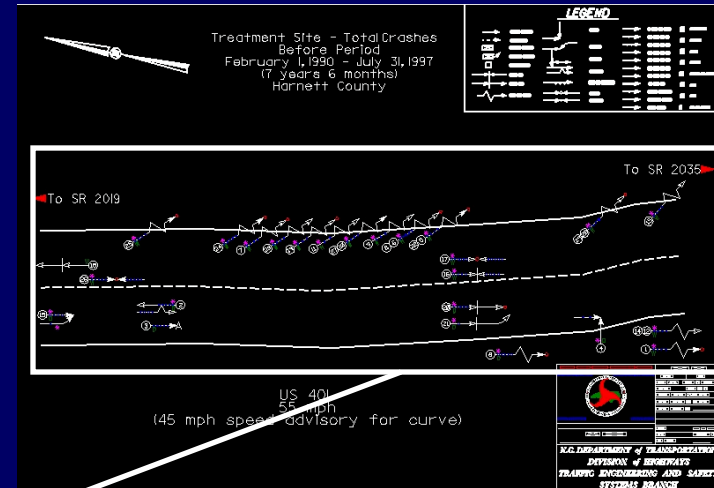


US 401 - Look South



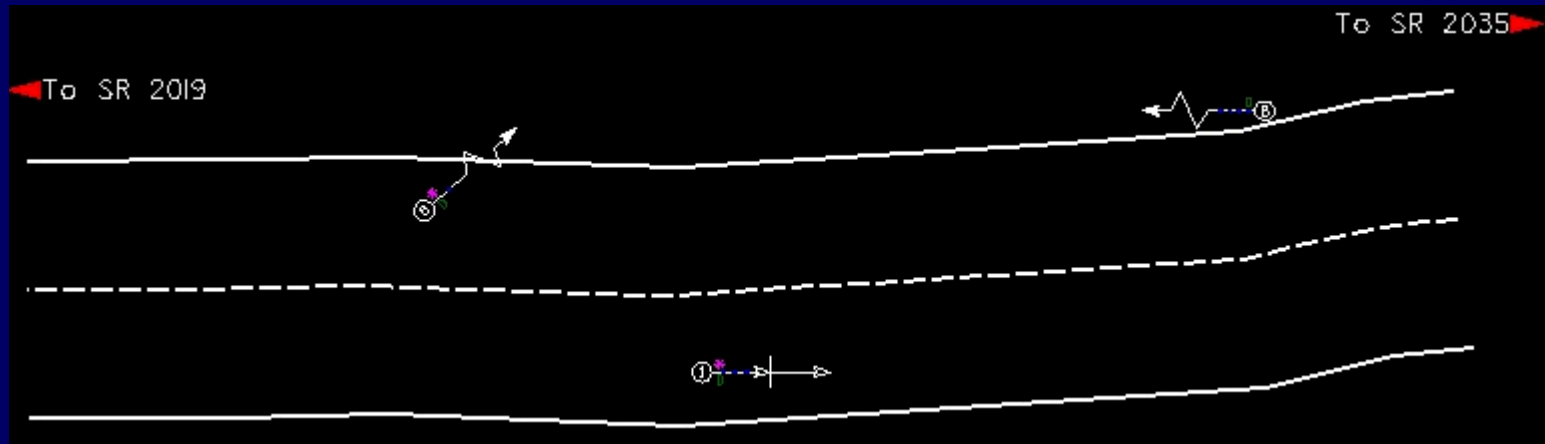
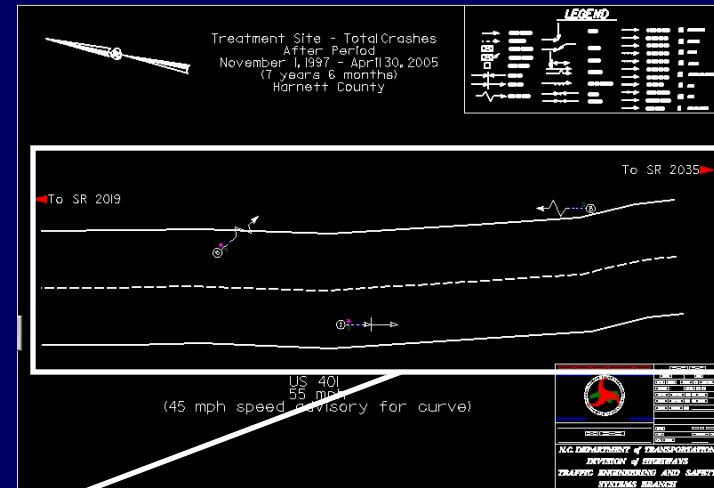
# Curve Wedging and Resurfacing Evaluation

## Before Collision Diagram



# Curve Wedging and Resurfacing Evaluation

## After Collision Diagram



# Curve Wedging and Resurfacing Evaluation

## Results

<u>Treatment Information</u>			
	Before	After	Percent Reduction (-) Percent Increase (+)
Total crashes	29	3	-89.7
Total Severity Index	6.9	1.0	-85.6
Target Crashes	22	0	-100.0
Target Severity Index	8.2	0.0	-100.0
Volume	5800	8200	41.4
<u>Treatment Injury Information</u>			
	Before	After	Percent Reduction (-) Percent Increase (+)
Fatal	0	0	0.0
Class A	1	0	-100.0
Class B	4	0	-100.0
Class C	9	0	-100.0
Property Damage Only	15	3	-80.0
<u>Target Injury Information</u>			
	Before	After	Percent Reduction (-) Percent Increase (+)
Fatal	0	0	0.0
Class A	1	0	-100.0
Class B	3	0	-100.0
Class C	8	0	-100.0
Property Damage Only	10	0	-100.0

- Total Crashes
  - Reduced 90 %
- Target Crashes
  - Reduced 100 %
- Wet Crashes
  - Reduced 100 %  
(22 to 0)

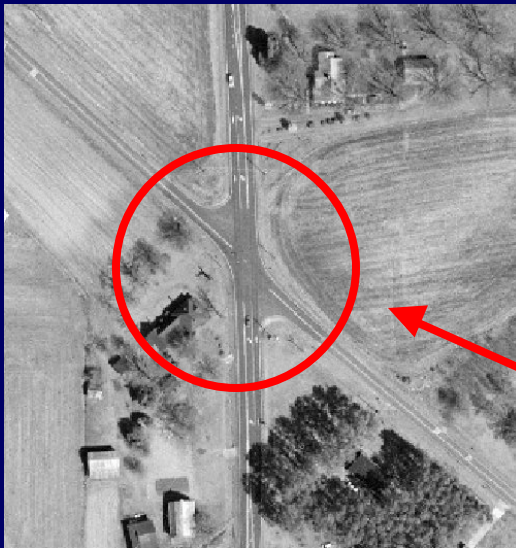
# Flashing Traffic Signal Evaluation





# Flashing Traffic Signal Evaluation

- Location:
  - SR 1001 (Lemon Springs) at SR 1146 (St Andrews Ch) in Lee County || SS# 08-95-220
- Countermeasure:
  - Install Overhead Flasher and Left Turn Lanes on SR 1001
  - Cost: \$100,000

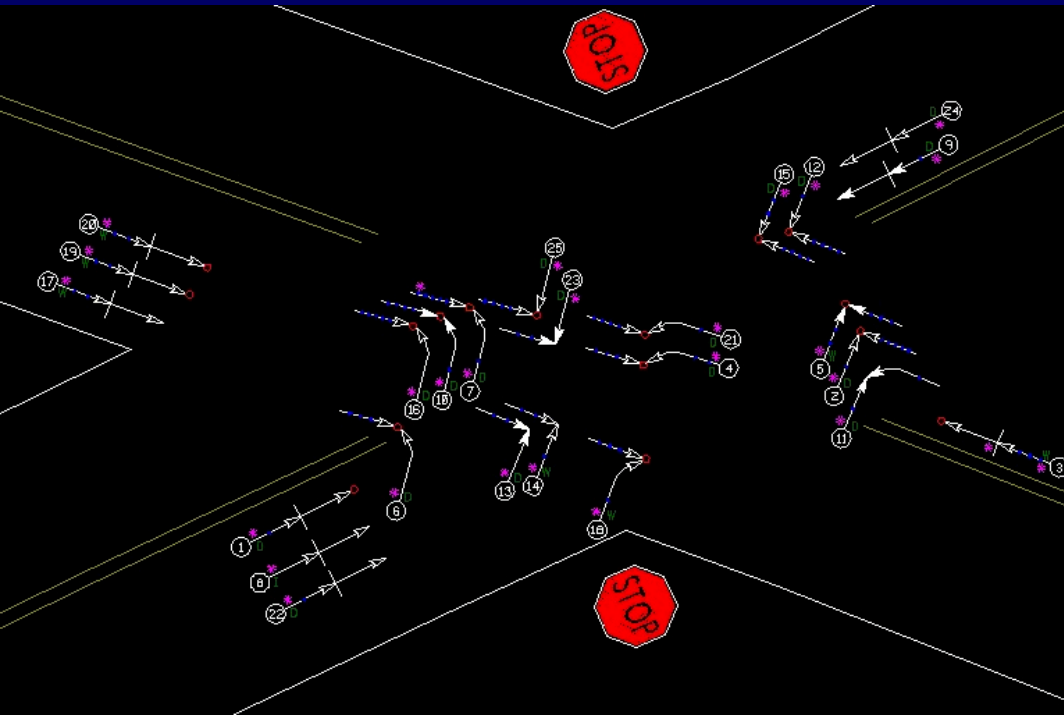


Treatment  
Intersection

# Flashing Traffic Signal Evaluation



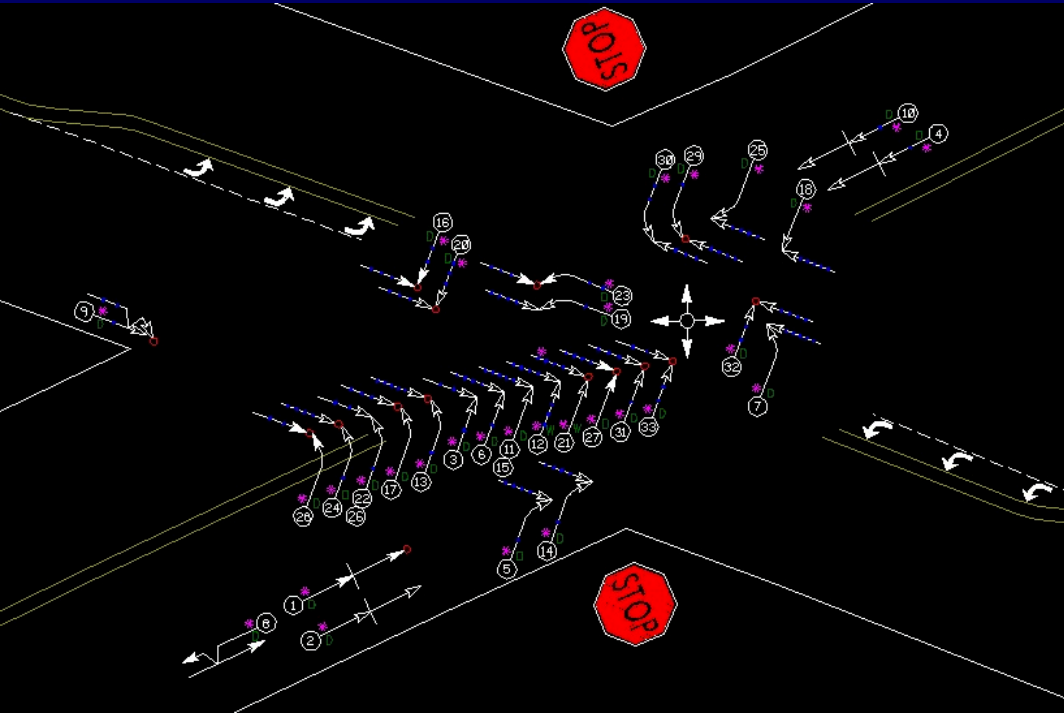
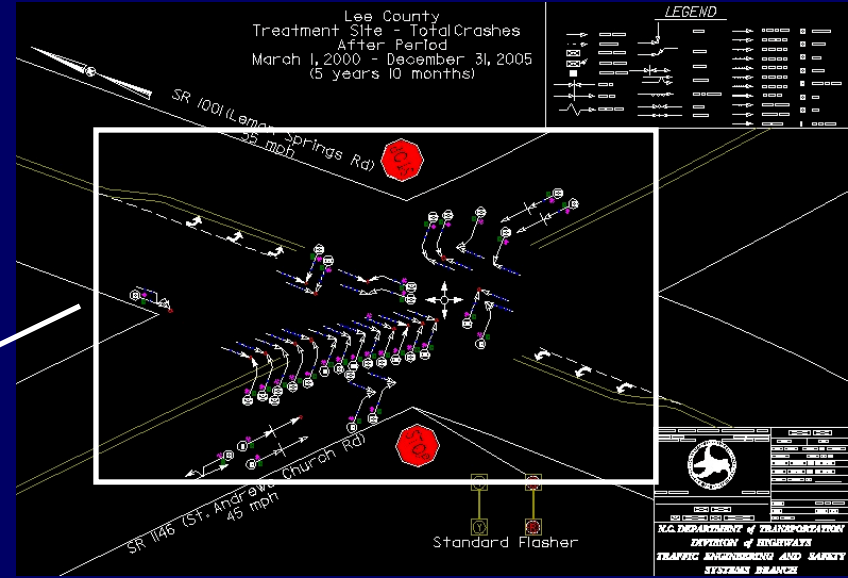
## Before Collision Diagram





# Flashing Traffic Signal Evaluation

After Collision Diagram



# Flashing Traffic Signal Evaluation

## Results

Treatment Information			
	Before	After	Percent Reduction (-) Percent Increase (+)
Total crashes	25	33	32.0
Total Severity Index	8.5	4.4	-48.5
Volume	7900	7600	-3.8
Treatment Injury Crashes			
	Before	After	Percent Reduction (-) Percent Increase (+)
Fatal	0	0	0.0
Class A	1	0	-100.0
Class B	2	1	-50.0
Class C	13	14	7.7
Property Damage Only	9	18	100.0

Target Crashes			
	Before	After	Percent Reduction (-) Percent Increase (+)
Frontal Impact Crashes	16	28	75.0
Frontal Severity Index	10.8	4.7	-56.6
Rear End Crashes	9	4	-55.6
Rear End Severity Index	4.29	2.85	-33.6
Frontal Injury Crashes			
	Before	After	Percent Reduction (-) Percent Increase (+)
Fatal	0	0	0.0
Class A	1	0	-100.0
Class B	2	1	-50.0
Class C	9	13	44.4
Property Damage Only	4	14	250.0
Rear End Injury Crashes			
	Before	After	Percent Reduction (-) Percent Increase (+)
Fatal	0	0	0.0
Class A	0	0	0.0
Class B	0	0	0.0
Class C	4	1	-75.0
Property Damage Only	5	3	-40.0

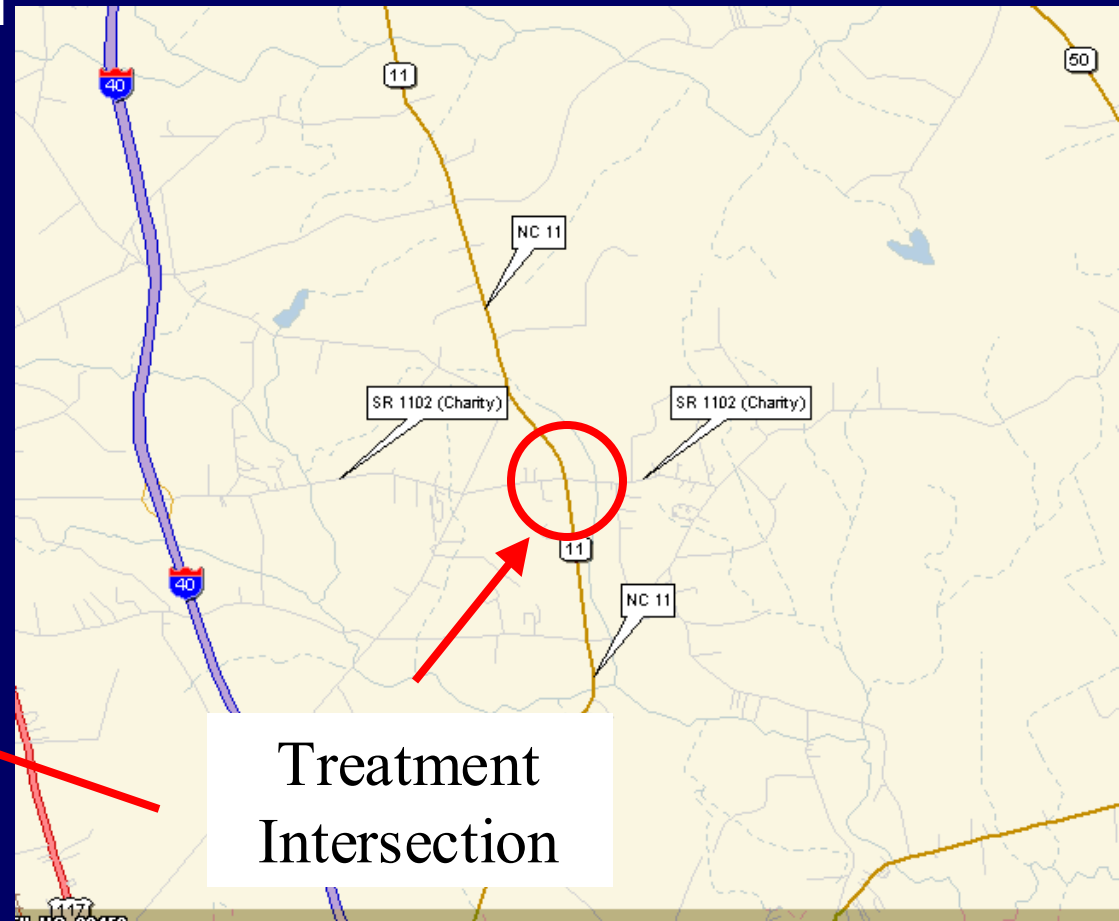
- Total Crashes
  - Increase 32 %
- Frontal Impact Crashes
  - Increased 75 %
- Rear End Crashes
  - Decreased 56 %
- Total Crash Severity Index
  - Decreased 49 %
- Frontal Impact Crash Severity Index
  - Decreased 56 %
- Rear End Crash Severity Index
  - Decreased 34 %

# Vehicles Entering When Flashing Evaluation



# Vehicles Entering When Flashing Evaluation

- Location:
  - NC 11 at SR 1102 (Charity) in Duplin County || SS# 03-97-401
- Countermeasure:
  - Actuate Existing Overhead Flasher and Install Post Mounted Vehicle Entering When Flashing Signs
  - Cost: \$10,000





# Vehicles Entering When Flashing Evaluation

NC 11 - Look North



NC 11 - Look South



SR 1102 - Look West

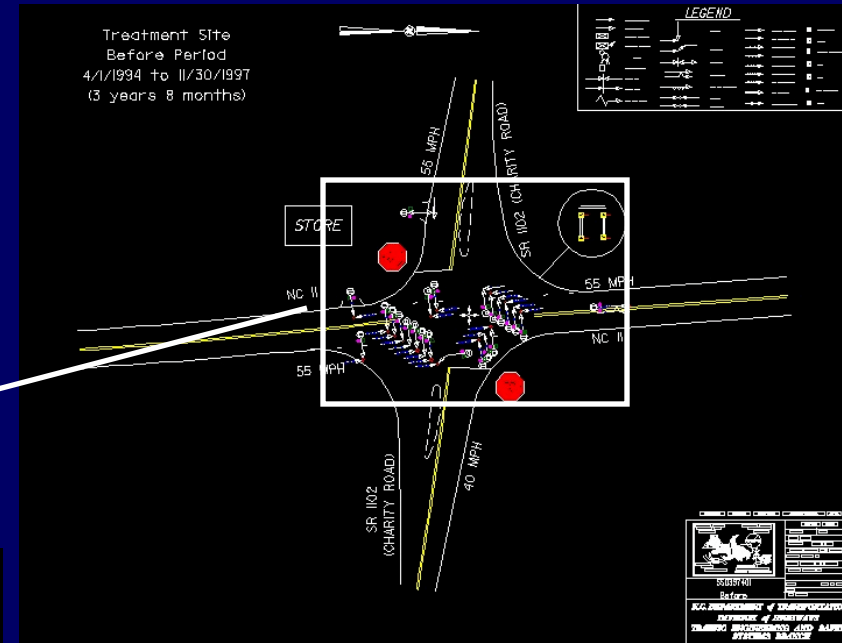
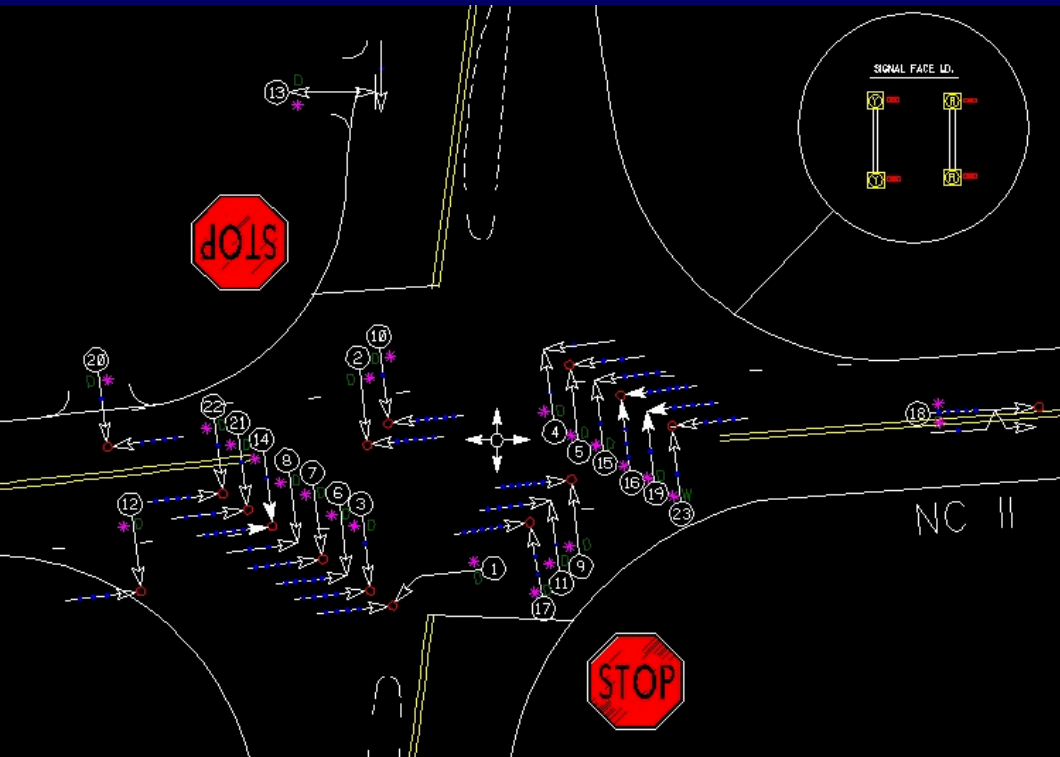


SR 1102 - Look East

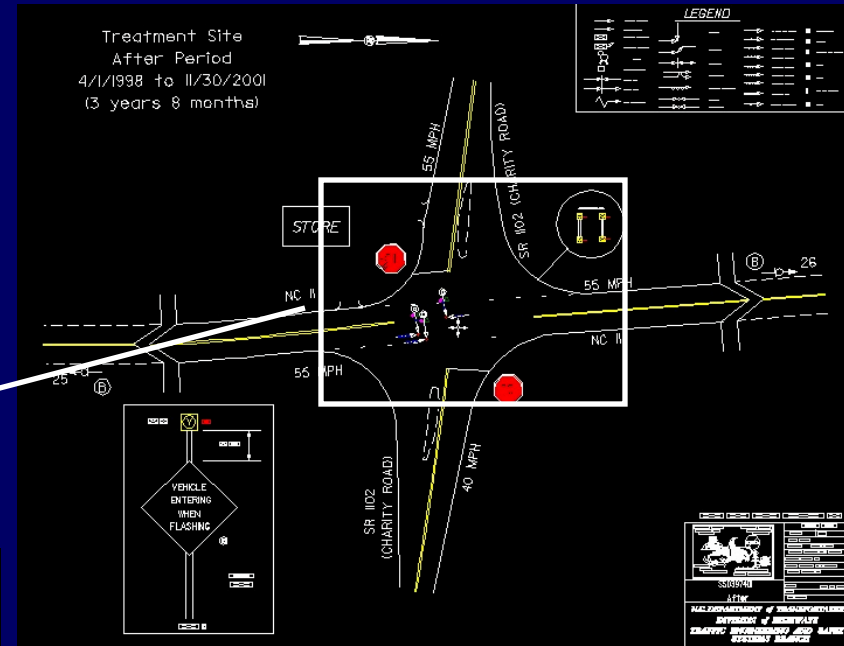


# Vehicles Entering When Flashing Evaluation

## Before Collision Diagram



## After Collision Diagram



# Vehicles Entering When Flashing Evaluation

## Results

### Treatment Information

	Before	After	Percent Reduction (-)/ Percent Increase (+)
Total Crashes	23	3	- 87.0
Total Severity Index	15.07	8.40	- 44.3
Angle Crashes	19	3	- 84.2
Angle Severity Index	13.65	8.40	- 38.5
Volume	4400	4700	6.8

- Total Crashes
  - Reduced 87 - 92 %
- Angle Crashes
  - Reduced 84 %

### Comparison Information

	Before	After	Percent Reduction (-)/ Percent Increase (+)
Total Crashes	33	51	54.5
Total Severity Index	3.02	8.83	192.4
Angle Crashes	1	9	800.0
Volume	2500	2500	0.0

### Odds Ratio: Treatment versus Comparison

	Before	After	Percent Reduction (-)/ Percent Increase (+)
Treatment Total Crashes	23	3	---
Comparison Total Crashes	33	51	- 91.6 %